

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
21 May 2004 (21.05.2004)

PCT

(10) International Publication Number
WO 2004/042443 A1

(51) International Patent Classification⁷: **G02B 6/28,**
6/12, 26/00

(21) International Application Number:
PCT/GB2003/004723

(22) International Filing Date:
3 November 2003 (03.11.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0225595.8 2 November 2002 (02.11.2002) GB

(71) Applicant (for all designated States except US): **QINETIQ LIMITED** [GB/GB]; Registered Office, 85 Buckingham Gate, GB-London SW1E 6PD (GB).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **JENKINS, Richard,**

Michael [GB/GB]; Qinetiq Limited, malvern technology centre, St Andrews Road, Malvern, Worcestershire WR14 3PS (GB). **MCNIE, Mark, Edward** [GB/GB]; Qinetiq Limited, Malvern Technology Park, St Andrew's Road, Malvern, Worcestershire WR14 3PS (GB).

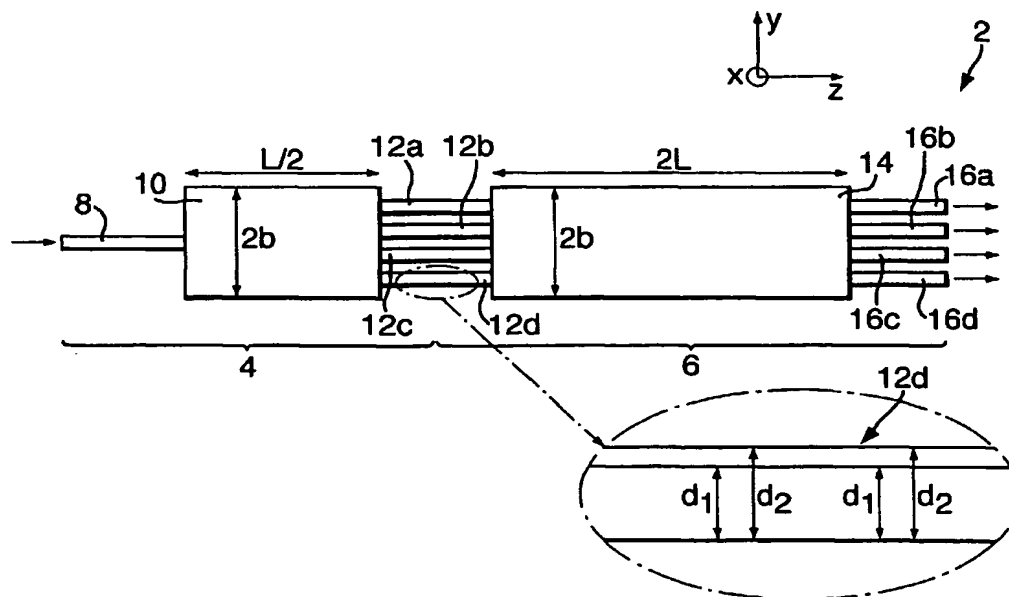
(74) Agent: **DAVIES, P;** D/IP Qinetiq Formalities, Cody Technology Park, A4 Building, Room G016, Ively Road, Farnborough, Hampshire GU14 0LX (GB).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE,

[Continued on next page]

(54) Title: **HOLLOW CORE MULTI-MODE INTERFERENCE OPTICAL DEVICE**



(57) Abstract: A hollow core multi-mode interference (MMI) device is described that comprises a multi-mode waveguide (10, 14) optically coupled to at least two fundamental mode waveguides (8, 12, 16). The device is characterised in that it comprises a means for varying the internal cross-sectional dimensions of a portion of one or more of said at least two fundamental mode waveguides. In particular, the side wall of a fundamental mode waveguide having a substantially square cross-section can be moved using micro-electro mechanical systems (MEMS). Various optical routing devices incorporating such MMI devices are described.



SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

Declaration under Rule 4.17:

— of inventorship (Rule 4.17(iv)) for US only

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.